REMARKS

I. Introduction

In response to the Office Action dated September 23, 2002, claim 8 has been cancelled, claims 1, 2, 3, 4 and 5 have been amended, and 11-29 have been added. Claims 1-7 and 9-29 remain in the application. Re-examination and re-consideration of the application, as amended, is requested.

II. Examiner Interview

On December 11, 2002, attorney Bradley K. Lortz called Examiner Matthew Landau to clarify the intended cited reference identified in the §102 rejection in paragraph (10) of the Office Action. Examiner Landau confirmed that the Office Action incorrectly identifies the B. Mason et al., "Sampled Grating DBR Lasers with 22nm Quasi-Continuous...", and the intended cited reference is B. Mason et al., "Ridge Waveguide Sampled Grating DBR Lasers with 22-nm Quasi-Continuous Tuning Range", IEEE Photonics Technology Letters, Sept. 1998.

III. Drawing Objections

In paragraph (1), the Office Action asserts that FIGS. 1 and 3 should be designated by a legend such as –Prior Art—because only that which is old is illustrated.

In response, Applicants have amended FIGS. 1 and 3 as suggested by the Office Action. Note: as discussed below, FIG. 1 has also been amended to be re-labeled as FIG. 2 to be consistent with the descriptions in the specification.

Further in paragraph (1), the Office Action objects to the drawings under 37 CFR §1.83(a) and asserts that the method steps of selecting a preferred coupling constant and determining the average coupling constant must be shown or the features canceled from the claims.

In response, Applicants have provided new FIG. 9 which incorporates the text of the original claim 5 into a flowchart. In addition, the specification has been amended as indicated above, to identify the figure (as the preamble of original claim 5) at page 7, line 4 and also to recite the text of the original claim at page 9, line 9. No new matter is involved. Accordingly, Applicants respectfully request withdrawal of the present objection.

Finally in paragraph (1), the drawings are objected as failing to comply with 37 CFR §1.84(p)(5) because the Office Action asserts that the reference characters shown in the drawings are not mentioned in the description. The Office Action requires a proposed drawing correction, corrected drawing, or amendment to the specification to add the reference sign(s) in the description to avoid abandonment of the application. The Office Action advises that the objection to the drawing will not be held in abeyance.

In response, Applicants have reviewed the drawings and specification and find that all reference numerals identified in the drawings are found in the specification. However, Applicants have amended FIG. 2 (now labeled FIG. 1 – see Specification Objection below) to include reference numeral 10 found in the specification but not found in the figure. The proposed drawing change is highlighted on the drawing submitted herewith. No new matter is involved.

IV. Specification Objection

In paragraph (2), the Office Action objected that the descriptions of FIGS. 1 and 2 do not match the drawings.

In response, Applicants have amended FIGS. 1 and 2 to reverse the labels on the drawings (old FIG. 1 is new FIG. 2 and vice versa) to be consistent with the descriptions in the specification. Furthermore, the specification has been amended at page 7, line 8 to properly refer to FIG. 1. No new matter is involved.

In addition, Applicants have also amended the specification at page 8, line 21 to correct an obvious typographical error.

V. Claim Amendments

Applicants' attorney has made amendments to the claims as indicated above. Particularly, independent claims 1, 4 and 5 have been amended to include limitations of a sampled grating including a plurality of sampled grating portions comprising a first phase separated from each other by portions with no grating and a first grating burst portion at the beginning of a first sampled grating portion of the sampled grating and comprising a second phase, said second phase being different from the first phase. See FIGS. 4 and 5 and page 8, lines 10-15 of the application for support. No new

matter is involved. Other corrective amendments have also been made to the claims as indicated above.

VI. New Claims

New claims 11-29 have been added. For support, see FIGS. 4-8b and page 8, lines 10-25 of the application as filed. No new matter is involved.

VII. Office Action Double Patenting Rejection

In paragraph (3), the Office Action advises that should claim 8 be found allowable, claim 9 will be objected to under 37 CFR §1.75 as being a substantially similar duplicate thereof.

In response, Applicants have cancelled claim 8.

VIII. Non-Art Rejections

In paragraphs (4)-(5) of the Office Action, claims 4-10 were rejected under 35 U.S.C. §112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Specifically, the Office Action asserts that "the method for configuring a selected grating distributed Bragg reflector, including the specific steps of: selecting a preferred coupling constant, selecting a preferred tuning range, generating a sampling function, and sampling the reflector" is not sufficiently supported by the specification. The Office Action further asserts that there is no explanation of how the aforementioned steps are to be accomplished, nor are any specific examples provided.

In response, Applicants have amended the independent claims as indicated above to overcome the rejection. As discussed in the application, phase mask technology for printing gratings, allows the sampling function to take on a value of +1, 0 and –1, with a manufacturable process that can be used to create sampled gratings. Phase masking is well known to those skilled in the art. See page 8, lines 4-7 of the application as filed. The application provides at least four specific examples of gratings as shown in FIGS. 5 (bottom two panels), 7(b) and 8(b).

In paragraphs (6)-(7) of the Office Action, claims 1-10 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

In response, Applicants have amended claims 1, 3, 4 and 5 as indicated above to overcome this rejection.

IX. Prior Art Rejections

In paragraphs (8)-(9) of the Office Action, claims 1-3 were rejected under 35 U.S.C. §102(e) as being anticipated by Reid et al., U.S. Patent No. 6,345,135 (Reid). In paragraph (10) of the Office Action, claims 4-10 were rejected under 35 U.S.C. §102(b) as being anticipated by B. Mason et al., "Ridge Waveguide Sampled Grating DBR Lasers with 22-nm Quasi-Continuous Tuning Range", (Mason). See Examiner Interview, above.

Independent claims 1, 20 and 25 are directed to an apparatus and methods having a sampled grating including a plurality of sampled grating portions separated from each other by portions with no grating and a first grating burst portion at the beginning of a first sampled grating portion of the sampled grating and comprising a second phase, said second phase being different from the first phase. Claims 4, 5 and 17 are directed to an apparatus and methods having a sampled grating including a plurality of sampled grating portions separated from each other by portions with no grating wherein the sampled grating portions each have a first phase and a second phase.

The cited references do not teach or suggest these various elements of Applicants' independent claims. Particularly, the cited references do not teach or suggest sampled grating portions separated from each other by portions with no grating where, either a first grating burst portion is included at the beginning of a first sampled grating portion of the sampled grating comprising a second phase different from a first phase of the sampled grating portions (as in claims 1, 20 and 25) or where the sampled grating portions each have a first phase and a second phase (as in claims 4, 5 and 17).

Reid describes a multi-wavelength optical reflector comprises a diffraction grating structure (18) which comprises a plurality of repeat grating units (20) in which each grating unit (20) comprises a series of adjacent diffraction gratings (22, 24, 26) having the same pitch. The grating units (20) and adjacent gratings within a grating unit are separated by a phase change (28) of

substantially π. The lengths of the gratings (22, 24, 26), which are different for each grating within a grating unit, are selected so as to provide a predetermined comb reflection spectrum which comprises a plurality of reflection maxima of substantially equal reflectivity.

However, Reid lacks any discussion about a sampled grating including a plurality of sampled grating portions separated from each other by portions with no grating as presently claimed in all the independent claims. Instead, Reid teaches away from Applicants' invention because it describes only a plurality of repeat grating units (20) in which each grating unit (20) comprises a series of adjacent diffraction gratings (22, 24, 26). Reid specifically teaches that "advantageously adjacent grating units and/or gratings within a grating unit are substantially contiguous." See column 2, lines 55-56. Teaching that contiguous gratings are advantageous teaches directly away from grating portions separated from each other by portions with no grating. (Applicants also note that such contiguous grating portions are distinguished from the present invention at page 9, lines 17-20 of the application.) Furthermore, Applicants submit that such teaching would preempt the suggestion to combine Reid's teaching with a conventional sampled grating distributed Bragg reflector to yield the present invention.

In view of the above, Applicants respectfully submit that because each and every element of the claimed invention is not taught or suggested by Reid, the present §102 rejection is overcome.

On the other hand, Mason describes a ridge waveguide sampled-grating distributed-feedback laser with continuous wavelength coverage over a 22-nm tuning range. The design is based on a 400-nm-thick 1.4 μm bandgap waveguide optimized for carrier injection tuning with offset quantum wells used to form the active region. The offset quantum wells used to form the active region. The offset quantum wells enable the device to be fabricated with only a single metal-organic chemical vapor deposition regrowth step. By tuning both mirror sections and the phase control section, the device obtains 27 wavelength-division-multiplexed channels spaced at 100 GHz and centered in the ITU grid with equal output power and greater than 40 dB of sidemode suppression ratio.

However, Mason also lacks any discussion about either a grating burst portion at the beginning of a first sampled grating portion (as in claims 1, 20 and 25) or wherein sampled grating portions each have a first phase and a second phase (as in claims 4, 5 and 17). Instead, Mason teaches away from Applicants' invention because it describes only that "the front and back grating mirrors

are periodically sampled at intervals of 64 and 71 μm respectively", which is typical of a conventional sampled grating DBR as discussed in the present application. See FIG. 3 and page 7, line 26 to page 8, line 1 of the application.

In view of the above, Applicants respectfully submit that because each and every element of the claimed invention is not taught or suggested by Mason, the present §102 rejection is overcome.

Moreover, the various elements of Applicants' claimed invention together provide operational advantages over Reid. For example, as discussed at page 9, lines 9-13 of the application, it is advantageous that the areas without grating are technologically easier to produce with high tuning efficiency and reliability, as they have no etch damage and less exposed surface area. In addition, Applicants' invention solves problems not recognized by Mason. The present invention provides for tuning of sampled grating mirrors, not considered by Mason.

Thus, Applicants submit that independent claims 1, 4, 5, 17, 20 and 25 are allowable over Reid and Mason. Further, dependent claims 2-3, 6, 7, 9-19, 21-24 and 26-29 are submitted to be allowable over Reid and Mason in the same manner, because they are dependent on their respective independent claims 1, 4, 5, 17, 20 and 25, and thus contain all the limitations of the independent claims. In addition, dependent claims 2-3, 6, 7, 9-19, 21-24 and 26-27 recite additional novel elements not shown by Reid and Mason.

X. Conclusion

In view of the foregoing, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited. Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicants' undersigned attorney.

Respectfully submitted,

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APPENDIX A: VERSION WITH MARKINGS TO SHOW CHANGES MADE TO THE SPECIFICATION

Please amend the specification as follows:

Amend the paragraph at page 7, line 8 as follows.

Figure <u>1</u>[2] depicts a widely-tunable, four-section SG-DBR laser 10 that makes use of two multi-peaked DBR mirror 12, 14, which are formed and configured in accordance with the present invention, to achieve an extended tuning range. Currents are applied to the various electrodes to provide a desired output optical power and wavelength as discussed in US Patent #4,896,325. As described therein, a current to the gain section 16 creates light and provides gain to overcome losses in the laser cavity; currents to the two differing SG-DBR wavelength-selective mirrors 12, 14 are used to tune a net low-loss window across a wide wavelength range to select a given mode; and a current to a phase section 18 provides for a fine tuning of the mode wavelength. It should also be understood that the sections 12, 14, 16, 18 are somewhat interactive, so that currents to any will have some effect on the parameters controlled by the others.

Please insert at page 7, line 4 the following new paragraph:

<u>Fig. 9 illustrates a method for configuring a selected grating distributed Bragg reflector for use in a laser having an output comprising at least one wavelength within a specific region of bandwidth.</u>

Insert at page 9, line 9, the following new paragraph:

Fig. 9 illustrates a method 900 for configuring a selected grating distributed Bragg reflector for use in a laser having an output comprising at least one wavelength within a specific region of bandwidth. The method comprises the steps of: a) selecting a preferred tuning range for said reflector at block 902; b) determining an average κ for the at least one output wavelength of the specific region of the bandwidth that is to be used at block 904; and c) generating a sampling function that, when applied to the reflector, results in the closest fit to the desired average κ with the smallest amount of variation within the preferred tuning range at block 906.

Amend the paragraph beginning at page 8, line 16, as follows:

Another sampling function is shown in Figure 6. Reversing the phase of the grating at the beginning and end of each sample can be used to tailor the peak envelope to allow for higher kappa over a larger range. Figures 7a and 7b illustrate an example of the peak envelopes that would result from the modification discussed in Figure 6, showing that the modification produces the intended effect: a mirror with a wider wavelength range and with a larger κ throughout.

APPENDIX B: VERSION WITH MARKINGS TO SHOW CHANGES MADE TO THE CLAIMS

Please cancel claim 8, amend claims 1, 2, 3, 4 and 5 and add new claims 11-29 as follows:

1. (AMENDED) An improved distributed Bragg reflector comprising:

a [first] sampled grating including a plurality of sampled grating portions comprising a first phase separated from each other by portions with no grating; and

a[t least a second] first grating burst portion at the beginning of a [spaced apart from said] first sampled grating portion of the sampled grating and comprising a second phase, said second phase being different from the first phase.

2. (AMENDED) The reflector of claim 1, wherein the [second portion has a] second phase is substantially opposite that of said first phase of said sampled grating[first portion].

3. (AMENDED) The reflector of claim 1, wherein [said spaced apart] the first sampled grating portion and [second] the first grating burst portion are spaced apart and configured to maximize a[the] coupling constant (κ) [as] substantially evenly [as possible] across a selected tuning range.

4. (AMENDED) A method for configuring a sampled[selected] grating distributed Bragg reflector for use in a laser having an output within a specific region of bandwidth, the method comprising the steps of:

a) selecting a preferred κ for at least one wavelength of the specific region of the bandwidth that is to be used;

b) selecting a preferred wavelength tuning range for said reflector; and

c) generating a sampling function that, when applied to the reflector, results in a substantially[the] close[st] fit to the preferred[desired average] κ [with the smallest amount of variation] within the preferred wavelength [selected] tuning range;

wherein the sampling function produces a sampled grating including a plurality of sampled grating portions each having a first phase and a second phase , the sampled grating portions separated from each other by portions with no grating.

5. (AMENDED) A method for configuring a sampled[selected] grating distributed Bragg reflector for use in a laser having an output comprising at least one wavelength within a specific region of bandwidth, the method comprising the steps of:

a) selecting a preferred tuning range for said reflector;

b) determining a[n]desired average κ for the at least one output wavelength of the specific region of the bandwidth that is to be used; and

c) generating a sampling function that, when applied to the reflector, results in a substantially[the] close[st] fit to the desired average κ [with the smallest amount of variation] within the preferred tuning range;

wherein the sampling function produces a sampled grating including a plurality of sampled grating portions each having a first phase and a second phase, the sampled grating portions separated from each other by portions with no grating.